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AGRICULTURE

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Research Report

Brent Paterson and a selection of wind turbines near Lethbridge

Blowing in the wind

An Alberta experimenter tilts at windmills

Until the middle of this century, many Alberta farmers considered wind turbines a crucial part of their operations, using them either to pump water or produce electricity. The Rural Electrification Program, however, changed that. The convenience of bought power held a strong appeal for farmers and lines were strung up across the prairies. Everything was fine until the 1970s when energy prices began to soar. The search for alternative sources of power hit high gear, and a number of southern Alberta farmers began wondering if they hadn't been too quick to tear down the old wind turbines. "Today," says Brent Paterson, head of the Drainage Branch of Alberta Agriculture's Irrigation and Conservation Division in Lethbridge, "there are about a dozen farmers in southern Alberta with wind turbines powerful enough to light up a small town. They're using them for electricity and draining water. The idea's really taking off."

With the help of an Alberta/Canada Energy Resources Research Fund grant, and a $113,220 grant from Alberta Agriculture's Farming for the Future program, Mr. Paterson along with Jensen Engineering of Olds and DRB Engineering Consultants Ltd. of Calgary, has been testing a variety of models of wind turbines to determine their effectiveness for both users and manufacturers. "Basically, what we want to do is help private enterprise develop domestic and international markets for locally-built turbines," he says. While the domestic market is the first priority, he sees tremendous potential for exports. "In central Africa and other developing regions, they are just beginning to use wind turbines to transport water to people in drought areas," he says. "In ten years, I can envision us exporting thousands of systems to those areas."

The systems vary greatly in size and power. At the low end are models about 25 feet high capable of pumping 10 to 12 gallons of water a minute. These, notes Mr. Paterson,

(continued on back page)

INSIDE:
What's the buzz?

What's the buzz?

Alberta apiculturists are overwintering bees

Many Albertans might consider prairie winters harsh, but beekeepers have more reason to complain than most. While they go to great lengths to protect their hives from the colder weather, sheltering them from wind and snow with elaborate fibreglass wraps, they still lose on average 15% to 20% of their stock annually. "If you don't do anything to recoup those losses," says Dr. Jerry Awram of Hines Creek, "it won't be long before you're out of business."

One way around the problem is simply to buy replacement stock, but that can be quite expensive – $25 to $30 a unit (a unit is the smallest part of a hive that may be self-sustaining, and must include a queen). If the average keeper loses 200 of his 1000 units each winter, that's a total annual cost of over $5,000. Dr. Awram, a veteran of 17 years in the business, and fellow beekeeper Dennis McKenna of Fairview, have, for the last four years, been experimenting with another possible solution, thanks to a $9,395 Alberta Agriculture Farming for the Future On-Farm Demonstration grant.

"To put it simply," says Dr. Awram, "what we've done is to take small units, or 'nucleus hives', away from our colonies in mid-June and put them away so that they can develop into new colonies, replacing the ones that don't make it through the winter." But the procedure is not as easy as it may sound. Each nucleus has to be small enough so the original hive is not affected by the loss, but large enough to have a chance of developing.

"The raising of queens requires skill and talent. It also requires more staff, which means more expense."

What's more, a queen has to be produced in each new unit. "The raising of queens requires skill and talent," says Dr. Awram. "It also requires more staff, which means more expense."

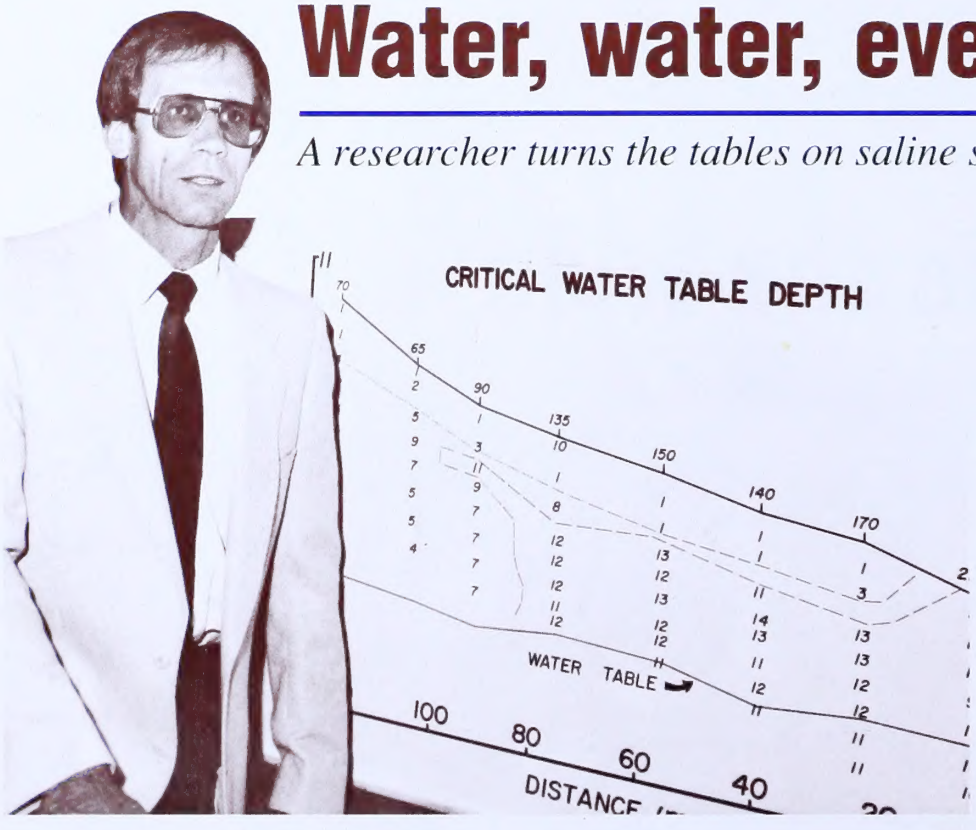
There are advantages, however, to raising your own queens rather than buying them from domestic or American producers. For instance, California stock (popular among western Canadian keepers) is bred for a different management style and climate than exist in Alberta. Producers down there are concerned primarily with selling bees to other producers so their stock builds up quickly but does not necessarily produce a great amount of honey. By controlling his own breeding, Dr. Awram hopes eventually to manage his bees so that they can withstand harsh winters at a reasonable cost.

The experiment demonstrates that it is possible for an Alberta beekeeper to be self-sufficient, but Dr. Awram is not yet satisfied that his procedure is cost-effective. It has proven more expensive than he had hoped. He has been able to recoup all his stock losses but has sometimes had to resort to rather extraordinary measures to do so. Last winter, for instance, he moved all his hives to Chilliwack, B.C., to take advantage of the warmer weather. "We're still working at it," he says. "But we're eternal optimists. I'm confident we'll come away from this with a viable method of at least reducing if not eliminating, our winter losses."

Hines Creek beek

Water, water, everywhere

A researcher turns the tables on saline soil



Alberta Agriculture soil specialist Hank Vander Pluym

Long before settlers began pulling down tr building roads, draining sloughs, filling re voirs and ploughing fields, there existed in so ern Alberta a delicate equilibrium of vegetation water supply. The grasses and trees in the region u virtually all available moisture. As a result, there very little percolation; the ground water table was and so was the soil salinity (a measure of salt, prin ily sodium sulphate, content). As settlement

"Anyone with a salinity problem should look seriously at lowering h water table by installing tiles"

creased, however, barriers to natural ground w flow were built, leaving some areas dry and some high water tables and high salinity. The latter p lem, says Hank Vander Pluym, a soil specialist Alberta Agriculture in Lethbridge, is now so seve some areas that a half-inch crust of salt can be fo on top of the soil, rendering it useless.

Since 1984, with the aid of a $262,700 grant f Alberta Agriculture's Farming for the Future gram, Mr. Vander Pluym has been investigating w

erry Awram

of lowering the water table and, consequently, the salinity level of afflicted land in the Lethbridge region. He has found that the water table has to be at least six feet below the surface to prevent salinity from becoming a problem. "When you're five feet from the surface or higher," he says, "the salt is being drawn to the surface by a capillary action. You're going to have trouble growing anything but forages. Salinity prevents a plant from absorbing water. If you have too much salt in the soil, the moisture level is irrelevant. The plant can be in the middle of a puddle and it will die of drought."

One way Mr. Vander Pluym has found of lowering salinity is simply by installing clay pipe or "tile" beneath the afflicted field (seven feet is the optimum depth). He followed the procedure at six sites of 20 acres each, monitoring the outflow from the pipes, the salinity of the field and the salinity of the outflow. In the first two years of the experiment, the discharge from the fields was remarkably high – up to 250 litres a minute. The water tables dropped to the level of the tiles and the salinity problems disappeared. "All in all, we had very good results," he says. "After the second year, the discharge slowed down but the soil is, by then, desalinized. Three of the sites had very good improvements, largely because the soils there were porous. The other three had tighter, firmer soil so the results were not so dramatic.

"What the experiment tells us", says Mr. Vander Pluym, "is that anyone with a salinity problem on a patch of land should look seriously at lowering his water table by installing tiles. It's not the answer for everyone, but it should be considered by everyone."

FARMING FOR THE FUTURE

by Doug Radke
Assistant Deputy Minister
Planning and Development
Sector

The bottom line. We hear that expression frequently these days – and usually when we find ourselves in a crunch, where we don't have the financial resources to do everything we want to do, or even those things that need to be done. But there are resources other than dollars, and more than one bottom line. We've come to know that the land and the water resources that sustain our agriculture are not free or everlasting. Proper management of these resources is fundamental to the future of agriculture. If we want to leave the very basis of farming to our children and grandchildren, we must act now to ensure that future. In many cases, the correct steps to take are either unknown, partially known or financially unacceptable. My Sector, Planning and Development, is concerned with these long-term issues and the research required to solve resource management problems.

The Planning and Development Sector accepts responsibilities related to public policy issues, including the allocation, development, management and conservation of agricultural land and water resources. Divisions and branches of the sector provide farmers and agricultural agencies with assistance in irrigation management, drainage, soil conservation and water management as well as broad and detailed resource planning. The Irrigation Secretariat provides administrative services for the Alberta Irrigation Council, a body responsible for administering the Irrigation Act under which organized irrigation districts operate.

Other units address the broader issues of grains and livestock policy, transportation and farm income support. They deal, as well, with farm management, production economics, statistics and market analysis, providing service and advice to farmers, government departments, farm organizations and agribusiness units.

Of the wide spectrum of issues with which we deal, none are more basic than soil, land and water. My Sector co-operates with Farming for the Future in supporting or conducting research on soil conservation, subsurface drainage and irrigation. Research helps us to ensure that the resource management techniques we promote are not only practical but are also based on sound scientific principles.

Our challenge is to nurture a sustainable balance between profitable farming now and long-term resource base conservation. The research described in this issue: Dr. Chanasyk, on soil erosion; Brent Paterson, on wind driven turbines for pumping water; and, Hank Vander Pluym, on subsurface drainage; is the kind of work that needs to be done to ensure the long-term viability of agriculture. And that's the other bottom line we have to keep our eyes on.

Down the slippery slope

Combatting erosion in Peace River country

Erosion losses in the Peace River region are "very subtle but very real," says Dr. David Chanasyk, an associate professor of soil science at the University of Alberta. "Farmers don't see the kind of horrendous gully formations that would make it clear they have a significant problem. Their fields get small rills a few inches wide. A farmer can go over his fields with a cultivator and the rills disappear. The field will look smooth and he'll think his problems are gone. But when the rill was forming, he was losing soil. That might not mean much in the course of a year, but over 15 or 20 years, it can add up."

Over the last three years, with the aid of a $198,700 Alberta Agriculture Farming for the Future grant, Dr. Chanasyk has been investigating the relationships between cropping practices and soil loss in the Peace River area. He compared erosion during spring runoff in a field of continuous crop fescue (grown for seed or cattle feed) with a typical rotation of fallow, canola and barley. He found that the fescue, with its vigorous and binding root system, offers great protection for soil. "I don't know if this is the best analogy," he says, "but it's almost like putting indoor-outdoor carpet over your field." He also found that barley stubble, with its dense root system, was more effective than canola stubble in preventing soil loss.

Our data tells them that if they have a piece of land on which there is a lot of erosion – maybe a long, sloping field – they might not want to put canola on it.

"The value of the experiment is that we had the different management practices side by side each year to show what the relative losses are," he says. "I've shown the results to a number of Peace country farmers. Some have been interested in the results of canola. Our data tells them that if they have a piece of land on which there is a lot of erosion – maybe a long, sloping field – they might not want to put canola on it. They might want to try fescue, or any of a number of grasses or forages."

Dr. David Chanasyk, associate professor of soil sciences at the University of Alberta

Another measure that can be taken to battle erosion is to leave the fields rough over the winter. Some farmers cultivate in the fall to reduce their spring workload – an admirable goal, says Dr. Chanasyk, but one that could lose them a lot of soil at runoff time, particularly if they have sloping fields (as do many farmers in the Peace River region). "The answer might be a compromise," he says. "They could cultivate the fields on which erosion isn't so great a factor and leave the rest. Or they might work across slope as much as possible. That prevents an easy flow of water off the land."

He also suggests northern Alberta farmers attempt to fight water erosion with some of the same techniques used by their southern Alberta brethren to fight wind erosion – breaking long fields into strips, perhaps using a stubble-fallow rotation. "I know of one guy in Peace River who's using that to great effect," he says.

While water erosion is no worse there than elsewhere in the province, it presents a challenge to farmers because their soil is relatively shallow. "A farmer might have only 10 centimetres of good soil," says Dr. Chanasyk. "So he doesn't have much to play with." Erosion takes the finest particles from a field, he notes, reducing its fertility and water-holding capacity. "That's what makes it dangerous."

Blowing in the wind...continued from page 1

could be used by a farmer who, for instance, wants to transport water to cattle at the far reaches of his spread. If the water source is about a mile from the nearest power line, it would cost him about $10,000 to string a new line, and about $1,000 more for a pump and float system. On the other hand, he could buy a wind turbine to do the entire job for about $3,000. "Just about any time you're a quarter mile from a power source," Mr. Paterson observes , "you should consider if a wind turbine won't be more economical for your operation than a new power line."

At the other end of the scale are massive turbines, 80 to 120 feet high, capable of pumping 300 gallons of water per minute in a 30 mph wind. Selling for about $100,000, they can produce 65 kilowatts at a time (five or 10 kilowatts is needed to supply the average house), and some can be hooked up to energy storage systems so that they supply power on demand. There are about a dozen of the larger variety operating in southern Alberta today, says Mr. Paterson, powering everything from schools to turkey farms to fertilizer mixers.

The ongoing research performed by Mr. Paterson (15 different models have been tested so far) has attracted attention from all over North America. But southern Alberta, with one of the best wind regimes on the continent, is where interest is hottest. "We had 200 people out to a demonstration and workshop in mid-July," he says. "People are really excited. Both the manufacturers and prospective users see a lot of potential here."